Visvesvaraya Technological University

Belagavi, Karnataka-590 018

A Project Report on

"IoT Based Smart Farming System"

A Project report submitted in partial fulfillment of the requirement for the VIII semester degree of

Bachelor of Engineering
In
Electrical & Electronics Engineering

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2020-2021

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Certificate

Certified that the Project work entitled **"IoT Based Smart Farming System"** has been successfully presented by **Mr. Mushtaqulla Baig (1CR17EE035), Mr. Shivram B Singh (1CR17EE067), Mr. Pradeep B (1CR17EE043), Ms. Unnathi J (1CR17EE079)** at CMR Institute of Technology, Bengaluru, in partial fulfillment of the requirements for the VIII Semester degree of Bachelor of Engineering in Electrical & Electronics Engineering of Visvesvaraya Technological University, Belagavi during the academic year 2020-2021. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the report deposited in the departmental library.

The Seminar report has been approved as it satisfies the academic requirements in respect of Seminar work as prescribed for the said Degree.

Signature of the Guide	*Signature of the HOD*	*Signature of the Principal*
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DECLARATION

We, [**Mr. Mushtaqulla Baig (1CR17EE035), Mr. Shivram B Singh (1CR17EE067), Mr. Pradeep B (1CR17EE043), Ms. Unnathi J (1CR17EE079)],** hereby declare that the Project report entitled **"IoT Based Smart Farming System"** has been carried out by us under the guidance of **Reshma P Eldho,** Assistant Professor, Department of Electrical & Electronics Engineering, CMR Institute of Technology, Bengaluru, in partial fulfillment of the requirements for the VIII Semester degree of **Bachelor of Engineering in Electrical & Electronics Engineering** of Visvesvaraya Technological University, Belagavi during the academic year 2020-2021.

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Abstract

Farming is backbone of economy and it is the fundamental method for occupation. The large population of world depends on farming for living day to day life.

Around 70% of Indian population depends on cultivation. Most of the cultivation cannot be productive only by physical activities so have to be handled by innovative technologies.

Therefore, we use IoT innovation and SMS notification to address the critical part of farming.

The past method of incorporating keen water supply system with smart idea.

This undertaking is a follow up to a past method whose highlight features incorporates keen water system with excellent control and insightful basic leadership in terms of exact continuous field information which regulates temperature, moisture and soil dampness of a particular crop.

Controlling of every one of these activities will be monitored by PC with Internet and the tasks being performed by interfacing sensors and Arduino.

With the observation results decision are to be made.

Acknowledgement

The satisfaction and euphoria that accompany the successful completion of any task would be incomplete without the mention of people, who are responsible for the completion of the Seminar work and who made it possible, because success is the outcome of hard work and perseverance, but steadfast of all is encouraging guidance. So with gratitude, I acknowledge all those whose guidance and encouragement served me to motivate towards the success of the Seminar work.

I take great pleasure in expressing my sincere thanks to ***Dr. Sanjay Jain****,* ***Principal, CMR Institute of Technology, Bengaluru*** *for providing an excellent academic environment in the college and for his continuous motivation towards a dynamic career. I would like to profoundly thank* ***Dr. B Narasimha Murthy****, Vice-principal of CMR Institute of Technology and the whole* ***Management*** *for providing such a healthy environment for the successful completion of the Seminar work.*

I would like to convey my sincere gratitude to ***Dr. K Chitra****,* ***Head of Electrical and Electronics Engineering Department, CMR Institute of Technology, Bengaluru*** *for her invaluable guidance and encouragement and for providing good facilities to carry out this Seminar work.*

I would like to express my deep sense of gratitude to ***Reshma P Eldho, Assistant Professor, Electrical and Electronics Engineering, CMR Institute of Technology, Bengaluru*** *for his/her exemplary guidance, valuable suggestions, expert advice and encouragement to pursue this Seminar work.*

I am thankful to all the faculties and laboratory staffs of ***Electrical and Electronics Engineering Department, CMR Institute of Technology, Bengaluru*** *for helping me in all possible manners during the entire period.*

Finally, I acknowledge the people who mean a lot to me, my parents, for their inspiration, unconditional love, support, and faith for carrying out this work to the finishing line. I want to give special thanks to all my friends who went through hard times together, cheered me on, helped me a lot, and celebrated each accomplishment.

Lastly, to the ***Almighty****, for showering His Blessings and to many more, whom I didn't mention here.*

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Chapter1

INTRODUCTION

Agriculture is the basic source of livelihood of people in India. In the past decade, it is observed that there is not much crop development in agriculture sector. Food prices are continuously increasing because crop rate is declined. Some of the factors which are responsible for this may be wastage of water, low soil fertility, fertilizer abuse, climate change, diseases, etc.

There are number of factors which are responsible for this, it may be due to water waste, low soil fertility, fertilizer abuse, climate change or diseases, *etc*. It is very essential to make effective intervention in agriculture and the solution is better management and regular maintenance and checking of the crops which include the technologies-IOT in integration with Wireless sensor networks, sensing the parameters with sensors and notifying the concerned people by SMS features. . It has potential to change the way of development in agriculture and gives great contribution to make it smart agriculture.

Monitoring systems are used in the field to collect information on farming conditions (e.g., light intensity, humidity, and temperature) with the aim of enhancing crop productivity. Internet of things (IoT) technology is a recent trend in numerous fields, including monitoring systems for agriculture. In conventional farming, farmers need manual labor to handle crops and livestock, often leading to inefficient resource use. This downside can be addressed through the concept of smart farming, whereby farmers receive training in the use of IoT, access to the global positioning system (GPS), and data management capabilities to increase the quantity and quality of their products.

Latest technologies such as Internet of Things and Cloud in combination with Wireless Sensor Networks can lead to agricultural modernization. IoT

is an ecosystem of connected physical devices that is accessible through the Internet. It consists of objects, sensor devices, communication infrastructure, computational and processing units. The sensors communicate the information over the Internet to the cloud server which is a computational and processing unit.

In this project, we developed a new farming monitoring system that has a robust design, high accessibility, and wireless communication. The system was integrated by using the input from sensors, interfaced with Arduino Uno, and using GSM as the interface with the end-user (Farmer mobile). Since our aim is to help the farmers, we tried to design the system to be more understandable to them without the need for complex theoretical background. Thus, the effectiveness of the process is improved compared to the traditional and manual appliances from the farmers.

1.1 Objectives of the Project

- To do smart farming with the help of IOT.
- Usage of water effectively in farming.
- To modernize the farming by IOT.
- Detection of animal intrusion in the agricultural field.

1.2 Layout of the Project

Listing the components to be used in the circuit. Drawing a block diagram of the circuit diagram to be used. Stating the methodology and processes to be done. Writing the detailed processes and working on it. Obtaining the results and try to make more improvisations. Taking note of the improvements in the subject and scope for future work.

Chapter 2

LITERATURE SURVEY

The research in agriculture area is enhanced in various aspects to improve the quality and quantity of productivity of agriculture. Researchers have been worked on many different projects on soil attributes, different weather conditions.

A few review studies examined the implementation of Artificial Intelligence (AI) and application of IOT for agricultural monitoring.

The authors highlighted smart farming system based on acquiring data and utilizing them to make optimized decisions, there by reducing the costs and enhancing environmental friendly practices.

A decision – making method was used for the identification and watering process, and they discussed the implementation of fuzzy logic system.

A system is developed by using sensors and according to the decision from a server based on sensed data, the irrigation system automated. By using wireless transmission, the sensed data forwarded towards to web server database. If the irrigation is automated, then that means if the moisture and temperature fields fall below the potential range. The user can monitor and control the system remotely with the help of application which provides a web interface to user.

The complete real-time and historical environment is expected to help to achieve efficient management and utilization of resources. we can move to IOT Based Smart Agriculture Monitoring System develop with various features like GPS based remote controlled monitoring, moisture and temperature sensing, intruders scaring, security, leaf wetness and proper irrigation facilities.

Chapter 3

COMPONENTS

The various components used in this project are:

1. Arduino Uno
2. PIR Sensor
3. Temperature Sensor
4. Soil Moisture sensor
5. Ultrasonic Sensor
6. LCD 16*2
7. Voltage Regulator
8. GSM Module
9. Relays
10. Power Supply Adaptor
11. Tank Pump
12. Drip Irrigation Pump

3.1 **Arduino Uno:** is an open source microcontroller based on the microchip atmega328p microcontroller.

Fig1: Arduino Uno

3.2 **PIR Sensor:** is used to sense the motion, always used to detect whether a human or animals has moved in or out of the sensor range. They are small, inexpensive, low power, easy to use and don't wear out. It uses infrared rays to detect the motion within its range. Sensitivity range up to **7 meters.** Power supply **5V** input voltage. Output is **digital signal** (**3V** output high when

motion detected). So it is called as Passive Infrared sensor or Pyro electric sensor.

Fig2: PIR Sensor

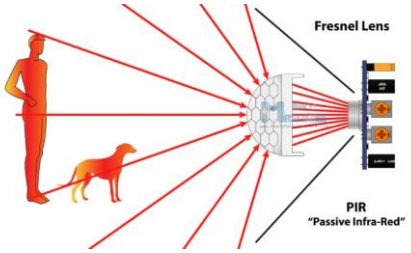

Fig3: Detection of Motion by PIR

3.3 **Temperature Sensor (LM35):** is a precession integrated circuit temperature sensor, whose output voltage varies, based on the temperature around it. It is cheap IC which can be used to measure temperature between -**55°C to 150°C**. Its output voltage is linear proportional to the instantaneous temperature. It is an **analog sensor**.

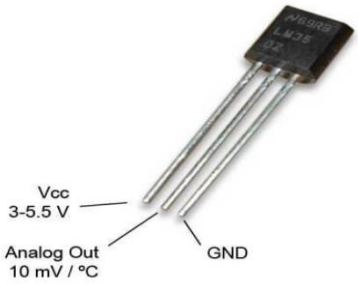

Fig4: LM35 Sensor

3.4 **Soil Moisture Sensor:** is used to detect the moisture of the soil. It is small, cheap, and easily available. Its operating voltage is 3.3-5V DC. It consists of a moisture sensor, resistors, capacitors, comparator LM393, Moisture detect LED. Easy to use with microcontrollers. The sensor has both analog and digital output. When there is more water is present in the soil, it will conduct more electricity that means resistance will be low and moisture level is high. When there is less water is present in the soil, it will conduct less electricity that means resistance will be high and moisture level is low.

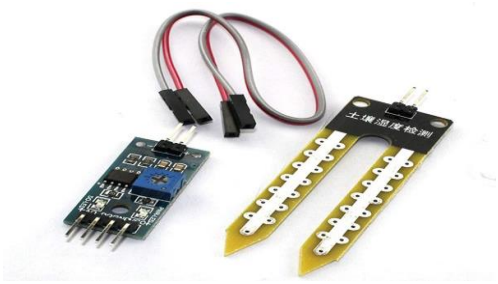

Fig5: Soil Moisture Sensor

3.5 **Ultrasonic Sensor:** is used to measure water level in tank. Ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic waves. It uses transducer to send and receive ultrasonic pulses. It is easy to use, can easily interface with microcontroller and they are not dangerous to operate, it has longer life, high accuracy. It is an analog sensor.

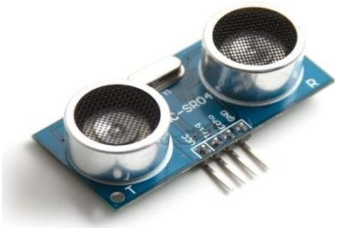

Fig6: Ultrasonic Sensor

3.6 **LCD 16*2:** It is one kind of electronic display module. It is inexpensive, simple programmable. The operating voltage is 4.7-5.3V. It includes two rows where each row can produce 16-characters. The alphanumeric and special symbols can be displayed in LCD.

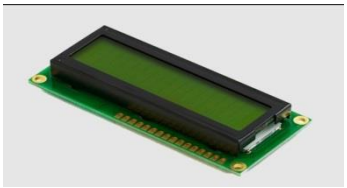

Fig7: LCD 16*2

3.7 **Voltage Regulator:** is an electrical or electronic device that maintains the voltage of a power source within prescribed limits.

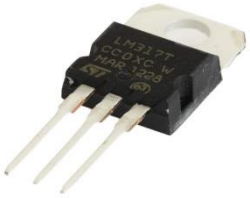

Fig8: Voltage Regulator

3.8 **GSM Module (Global System for Mobile Communication):** It is cellular wireless telecommunications. It is used to send the output messages to the registered mobile of farmer. It allows for transmission, sending and receiving voice calls. Low cost, long range connectivity, small in size. Supported frequencies are 850/950/1800/1900MHz.

Fig9: SIM800L GSM MODULE

3.9 Relays: is an electrical switch that is operated by an electromagnet. When activated the electromagnet pulls to either open or close an electrical circuit.

Fig10: Relay

3.10 Power Supply Adaptor: is an external power supply is used to power small electronic or electrical devices. Output of power supply adaptor is 12V DC.

Fig11: Power Supply Adaptor

3.11 Tank Pump: It is used to pump the water into the tank if the tank level is low. It is interfaced with the relay from protection of high current. In this project we have used submersible pump.

Fig12: Tank pump

3.12 Drip Irrigation Pump: It is used to pump the water from tank to farm field whenever necessary. It is also interfaced with the relay from protection of high current.

Fig13: Drip Irrigation pump

Chapter 4

METHODOLOGY

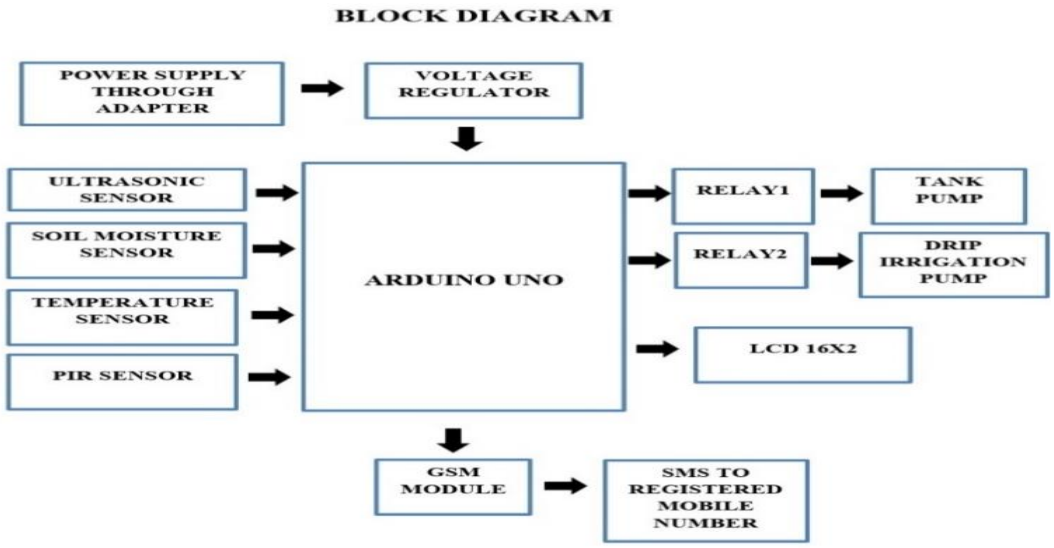

Fig14: BLOCK DIAGRAM

4.1 WORKING: Power supplied to arduino uno through power supply adaptor and voltage regulator.

Temperature sensor measures temperature of surrounding farm field analog output of the sensor send to the LCD through arduino. The respective temperature is displayed on the LCD.

PIR Sensor detects the intruder in the farm field the output of the sensor is digital signal will be send to LCD and also send SMS(i.e Intruder Detected) to registered mobile number. If the sensor does not detect any motion in the farm field then no SMS will be sent to registered mobile.

Soil Moisture sensor senses the moisture content in the soil. If the measured moisture content of the soil is higher than the predetermined value then no signal will be sent to relay2 through arduino Drip Irrigation pump will be in OFF State. If the measured moisture content of the soil is lower than the predetermined value then output signal will be sent to relay2 through

arduino. Relay2 gets activated the electromagnet makes the switch in ON condition which in turn Drip Irrigation pump operates (ON State). SMS (i.e. DRIP IRRIGARTION PUMP ON) will send to registered mobile number.

Ultrasonic sensor is used to measure the water level in the tank. If the water level is more than the predetermined value no signal will be sent to realy1 through arduino relay1 will be in off state Tank pump will also be in OFF State. If the water level is less than the predetermined (9 inches) value output signal will be sent to realy1 through arduino relay1 will be in ON state Tank pump will also be in ON State. SMS (i.e. TANK PUMP ON) will send to registered mobile number.

LCD will display message “Intruder detected” when PIR Sensor detects the motion in the farm, “Temperature value in °C” displayed simultaneously, “Moisture low and tank pump on” will be displayed when soil moisture sensor measured moisture is low. “Water level in tank in inches” measured by Ultrasonic sensor will be displayed in the LCD display.

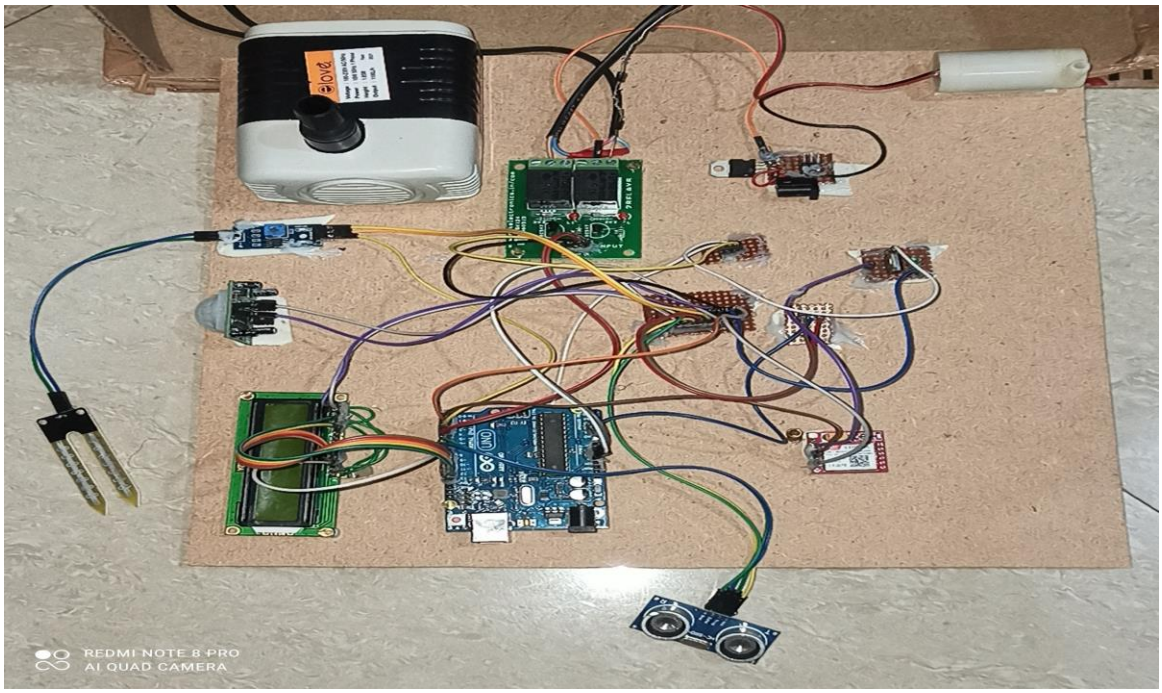

Fig15: HARDWARE MODEL

4.2 CONNECTIONS:

1. Arduino pins (13,12,11,10,9,8) connected to LCD pins (Rs,En,D4,D5,D6,D7) respectively.
2. Ultrasonic sensor trigger pin connected to 6^{th} pin of arduino and echo pin connected to 7^{th} pin of arduino input pin connected to 5V supply. Ground pin connected to gnd pin in arduino.
3. PIR Sensor output pin connected to 2^{nd} pin of arduino input pin given to 5V supply and ground pin connected to gnd pin arduino.
4. Soil moisture sensor output pin connected to 3^{rd} pin of arduino input pin connected to 5V supply and remaining pin connected to gnd.
5. Relays input connected to 5V supply one terminal connected to 4^{th} pin of arduino and another terminal connected to respective pumps.
6. Temperature sensor output pin connected to analog pin A0 in arduino.

Chapter 5

SIMULATION

5.1 SIMULATION PART1:

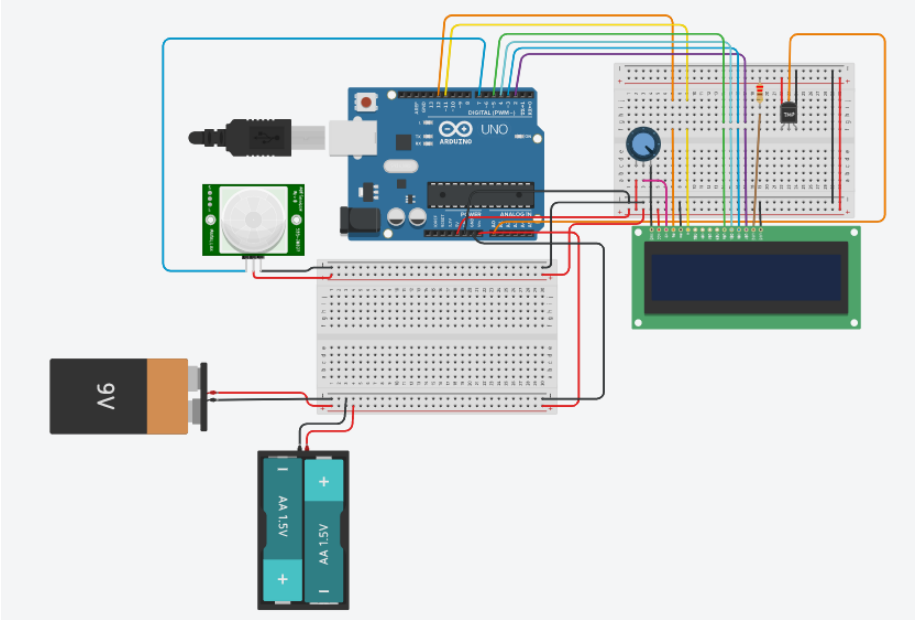

Fig16: Simulation part1

Part1 simulation completed using **TINKERCAD SOFTWARE**. In this simulation we used bread boards, PIR sensor, 12V battery, LM 35 temperature sensor , arduino uno , potentiometer, resistor(300Ω), LCD 16*2 display.

5.2 SIMULATION PART2:

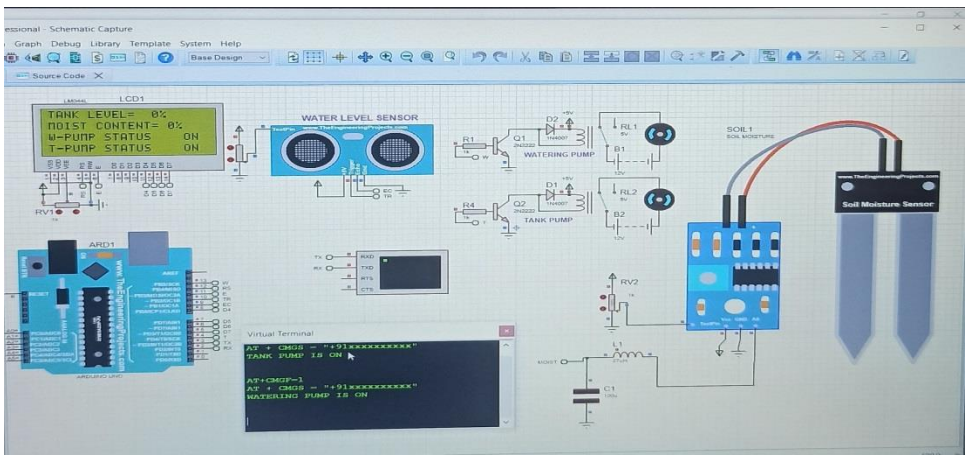

Fig17: Simulation part2 case1

Part 2 simulation is completed using **PROTEUS SOFTWARE**. In this simulation we used arduino uno, LCD display, Ultrasonic sensor, Soil Moisture Sensor, relays, resistors, capacitors, potentiometers, diodes, Tank pump, drip irrigation pump/watering pump etc.

Case 1: WATERING PUMP(WP) ON/TANK PUMP(TP) ON

If soil moisture content in soil is less then the set value (65%) then WP gets on. If water level in tank is less then set value then the TP gets on.

OUTPUT: shown on LCD and message is gone to the owner through GSM module.

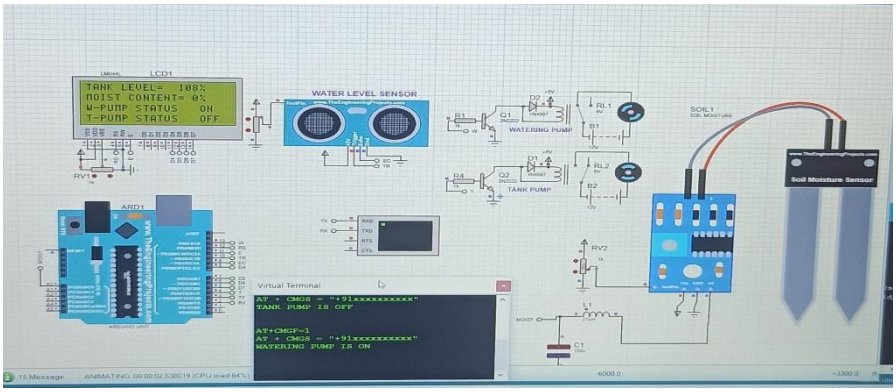

Fig18: Simulation part2 case2

Case 2: WP ON/TP OFF

If soil moisture content in soil is less than the set value (65%) then WP gets ON. If water level in tank is greater than set value then the TP gets OFF

OUTPUT: shown on LCD and message is gone to the owner through GSM module.

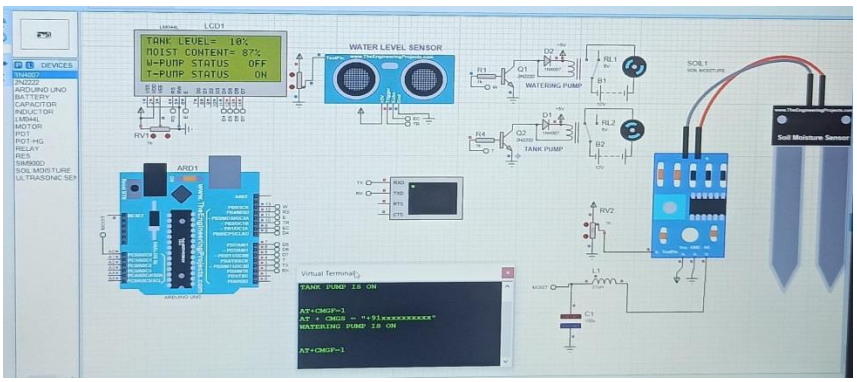

Fig19: Simulation part2 case3

Case 3: WP OFF/TP ON

If soil moisture content in soil is greater than the set value (65%) then WP gets off. If water level in tank is less then set value then the TP gets on

OUTPUT: shown on LCD and message is gone to the owner through GSM module.

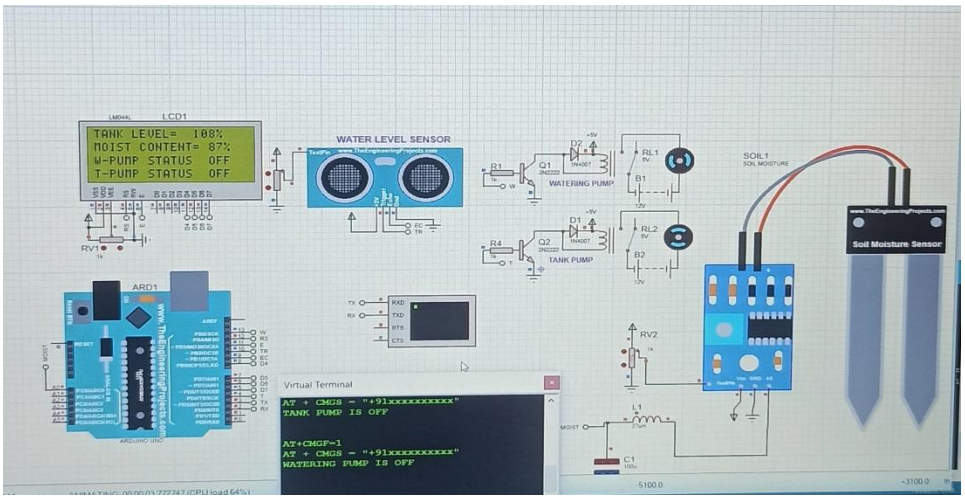

Fig20: Simulation part2 case4

Case 4 : WP OFF/TP OFF

If soil moisture content in soil is greater than the set value (65%) then WP gets off**.** If water level in tank is greater than set value then the TP gets off.

OUTPUT: shown on LCD and message is gone to the owner through GSM module

Chapter 6

ADVANTAGES AND APPLICATIONS

Advantages:

- Increased production and its quality.
- Water is used effectively.
- Remote monitoring.
- Automatic controlling of irrigation.
- Cost Effective.
- IOT technologies enables growers and farmers to reduce waste and enhance productivity.

Applications:

- System can be used in various farm lands.
- System can be used in green house farming.
- System can also be used in gardening.
- It can be used in Precision farming.

Chapter 7

RESULTS

LCD will display message “Intruder detected” when PIR Sensor detects the motion in the farm. Intruder can be either human or animals. “Temperature value in °C” displayed simultaneously by the use of temperature sensor, “Moisture low and tank pump on” will be displayed when soil moisture sensor measured moisture is low. “Water level in tank in inches” measured by Ultrasonic sensor will be displayed in the LCD display. SMS (i.e. DRIP IRRIGARTION PUMP ON) will send to registered mobile number when moisture content is low in the soil. SMS (i.e. TANK PUMP ON) will send to registered mobile number when water level in tank is low.

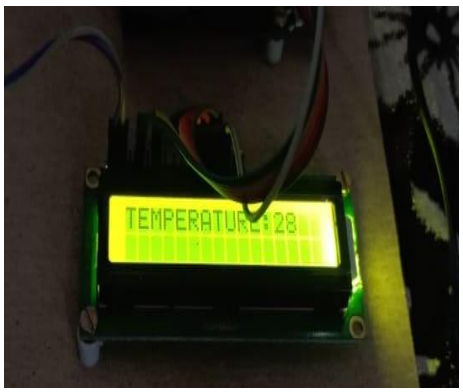

Fig21: Temperature value display

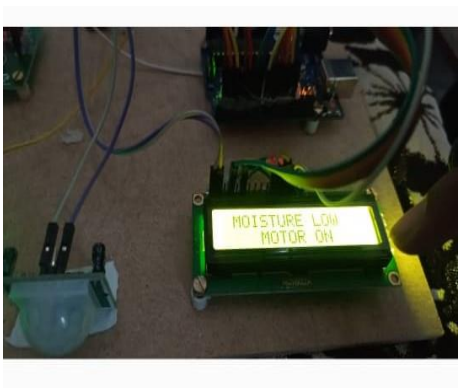

Fig22: Moisture low and motor on display

Fig23: ultrasonic measured water level

Fig24: PIR Detects motion

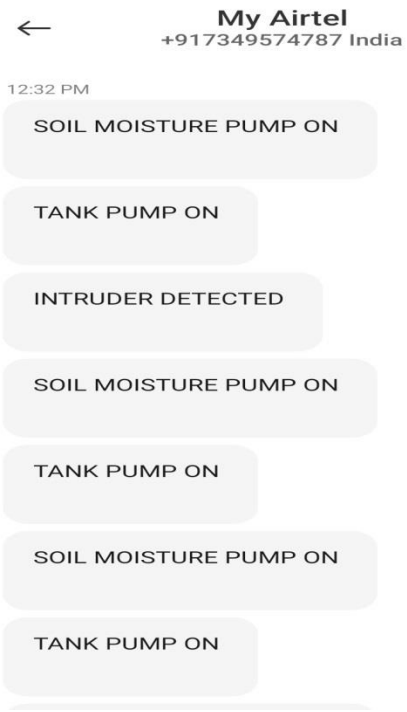

Fig25: SMS send to registered number

Chapter 8

CONCLUSION AND FUTURE WORK

Agriculture monitoring system is needed to reduce the need for human intervention in farming. This process is aimed to educate the farmer on the use of an integrated technology system to monitor the farm land to increase the quantity of the production of the crops. This project helps in efficient usage of water. This project can also be used in various farm lands. It can be used in gardening, greenhouse farming, horticulture etc. In this project intruder can be detected by pir sensor farmer now no need to be afraid of theft of his crops and destruction of his crops by animals.

For the future improvements we can implement the smart farming system with the use of AI, IoT, Machine learning and implement of cloud for the further improvement in the better analyses and getting more harvest in the agriculture field. The machine learning can be used to analyze the field and determine the harvest amount and quality. The AI technology, IoT and cloud computing technologies can be used to improvise the farming harvest and technologies. Cloud computing and technology is used to store the data and collect it and analyze it using machine learning. With more research and advancement in technology we can improvise the agriculture field so that we can minimize the wastage as much as much as possible and get maximum output to fulfill the demands of the growing population. Additional sensors like NPK sensor, humidity sensor and cameras can be used for better analysis and growth in the field of farming.

For future enhancement, we would like to attain more data so that we can run training and testing of the data. We will also validate the data with different subset. The fuzzy systems itself will be adjusted to be applicable for all types of crops. Different kinds of sensors such as pH sensors, carbon dioxide sensors, and light sensors can be installed .

Chapter 9

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